TOPICAL ANTIMICROBIAL DRESSINGS: AN OVERVIEW

Ashley Flores is Senior Infection Control Nurse, Mayday University Hospitals NHS Trust; Andrew Kingsley is Tissue Viability Nurse, Grampian NHS Trust

Topical antimicrobial dressings containing silver or iodine can be used to reduce the bioburden of critically colonised or locally infected wounds in order to promote wound healing. This article provides a guideline for best practice regarding the use of these dressings, and describes some of the products currently available.

Topical antimicrobials are chemicals which are used to either kill or control the growth of micro-organisms in wounds (White, 2002). There has been an increasing interest in the use of topical antimicrobial dressings as an alternative to systemic antibiotics (Capaldi, 2006). This stems from concerns over the development and spread of antibiotic resistance and the spectre of post-antibiotic diarrhoea from new strains of *Clostridium difficile* which have caused outbreaks and deaths in recent years.

For some patients, such as those with compromised arterial flow and chronic odema, the use of systemic antibiotics may have poor efficacy, therefore the treatment of chronic wounds with superficial, local wound infection is difficult (Morison et al, 1999). The careful use of a range of medicated dressings, such as those containing iodine and silver products, can successfully treat this group of patients (Morison et al, 1999). However, limited clinical evidence to guide their use has caused confusion as to which antimicrobial dressing to use and when (Brown, 2006). This may lead to these products being overused or used inappropriately.

Use of antiseptics in wound management must be subject to a risk-benefit assessment of possible local toxicity compared with beneficial antibacterial action (Kaye, 2000). This assessment needs to consider the stage of healing the wound is at and the nature of the wound tissues present, against the known toxicity of the product to immune cells (such as neutrophils, macrophages and lymphocytes), and to the cells of tissue regeneration (fibroblasts and keratinocytes). The use of antiseptics can be relevant in combating high bacterial loads that are causing local infection with cellulitis in the immediate peri-wound skin or critical colonisation where the wound does not have cellulitis but does not progress. However, cytotoxicity may be less relevant in a wound predominantly filled with slough and necrotic tissue than it is in wounds with new granulation and epithelial tissue present. A systematic approach needs to be adopted to ensure wounds are managed in an effective way (Capaldi, 2006). This is most easily achieved through the use of a systematic assessment framework such as Applied Wound Management (AWM) or TIME, wound tracing and photography. This article provides a guideline for best practice regarding the use of topical antimicrobial dressings.

When to use topical antimicrobials

Antimicrobial dressings can be used on acute or chronic wounds which are critically colonised, or when local and/or systemic infection is already compromising the wound or could compromise wound healing. When choosing an appropriate wound dressing it is vital to assess whether the wound is colonised, critically colonised or infected (p.132–42).

The presence of micro-organisms in a wound does not indicate that wound infection is inevitable; indeed, they may have a protective effect. The

presence of multiplying bacteria in a wound with no host reaction is termed colonisation (*Figure 1)*.

Critical colonisation has been defined as the multiplication of bacteria causing a delay in wound healing, usually associated with an exacerbation of pain not previously reported, but still with no overt host reaction (Kingsley, 2001). Signs of critical colonisation include:

- A continued delay in healing despite appropriate treatment (*Figure 2*)
- Thick slough that does not respond to standard debridement techniques
- Fast returning slough after sharp or larval debridement
- Malodour.

Levels of bacteria in critically colonised wounds need to be reduced to allow the wound to heal. The topical application of an antimicrobial is probably the most effective way to do this (Gray et al, 2005).

The development of an infection will be influenced largely by the virulence of the organism and the immune status of the patient. Patients considered most at risk are those being treated with long-term steroids and those receiving chemotherapy (Flanagan, 1997).

If a wound appears to be infected (*Figure 3*), it is important to confirm this and identify the causative organism(s) and possible sensitivities to antibiotics. A wound swab should be sent for microbiology, culture and sensitivity. The use of systemic antibiotics is supported where

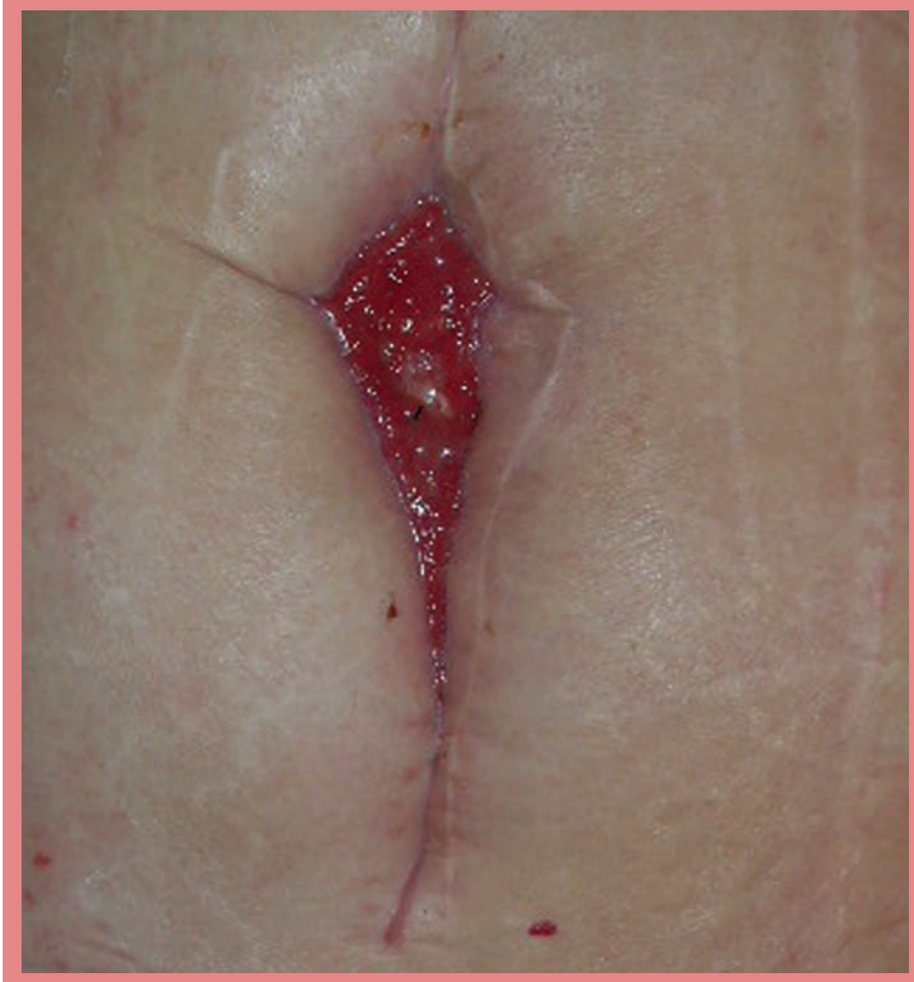

Figure 1. A dehisced, colonised abdominal wound showing signs of healing; granulation and epithelial tissue are present. There is no host reaction to colonisation.

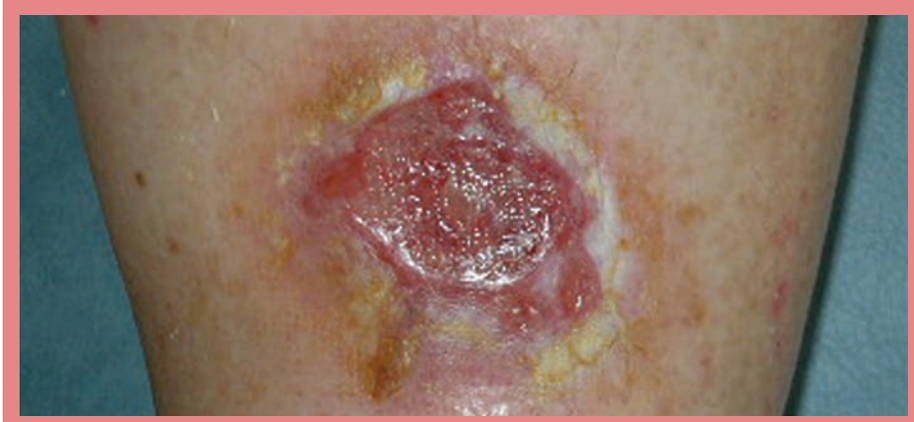

Figure 2. A critically colonised leg ulcer, 18 months on from insect bite. There is no cellulitis present, but the wound is not healing.

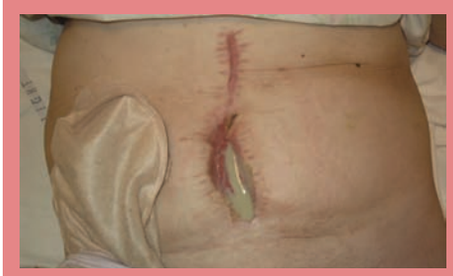

Figure 3. Formation ileostomy that has dehisced due to infection. Note the medium viscosity, high volume purulent exudate.

Table 1

Antimicrobial dressings containing silver or iodine

Product	Construction	Mode of action
Acticoat	Two layers of silver coated polyethylene mesh enclosing a single layer of non-woven rayon and polyester fabric	On activation with water sustained release of silver ions
Acticoat Moisture Control	A non-adhesive foam dressing with a film backing and a silver-coated wound contact layer	Absorbs exudate and gives a sustained release of silver ions
Contreet Foam	A non-adhesive foam dressing impregnated with silver. Adhesive and non-adhesive versions and sacral and heel shapes	Absorbs exudate and releases silver, more when more exudate is present and less when less is present
UrgoCell Silver	A non-adhesive foam with a silver-impregnated lipidocolloid interface for atraumatic dressing removal	Absorbs exudate and gives a sustained release of silver ions
Contreet Hydrocolloid	A silver impregnated hydrocolloid dressing	Forms a hydrocolloid gel for absorption of exudate and releases silver
Acticoat absorbent	Nanocrystalline silver in absorbent alginate fibre in a ribbon shape	On activation with exudate sustained release of silver ions with the benefit of absorbency
Aquacel Ag	A flat fleece of sodium carboxymethylcellulose (hydrocolloid) fibres containing ionic silver. Also comes as a flat ribbon	In presence of vertically wicked exudate the fibres form a gel and silver ions are made available
Silvercel	A high G (guluronic acid) alginate and carboxymethylcellulose fibre fleece containing silver	In presence of exudate absorbs and releases silver in ionic form. The high G format gives the dressing a wet strength that aids one piece removal
Actisorb Silver 220	An activated charcoal dressing impregnated with silver in a spun-bonded nylon envelope	As exudate penetrates, the dressing bacteria and odour particles are attracted and bound to the charcoal layer. The silver kills the bound bacteria and adsorbs endotoxin from that process
Urgotul SSD	A polyester mesh impregnated with carboxymethylcellulose, white soft paraffin and silver sulfadiazine	The impregnated tulle format allows atraumatic removal and disassociation of silver, and the antibiotic sulfadiazine provide two antibacterial agents
Inadine	A knitted viscose fabric impregnated with polyethylene glycol (PEG) and 10% povidone-iodine	In the presence of wound fluid the iodine is released from the povidone and the PEG
Iodoflex	Iodine bound into a cadexomer base. Comes as ointment, paste and powder for different situations and exudate levels	As exudate is absorbs into the cadexomer matrix iodine is released in a sustained manner
Sorbsan Silver	An absorbent alginate dressing containing silver nitrate ions within the fibres	Once the alginate comes into contact with exudate, the fibres gel and silver is released helping to reduce the bioburden
Polymem Silver	Polymem Silver is a foam dressing which contains glycerine, a cleanser F68 and nanocrystalline silver	Once exudate is absorbed into the dressing, the nanocrystalline silver particles help to kill the bacteria and help reduce the wound bioburden
Promogran Prisma	A freeze dried collagen matrix with added ionically bound silver	When in contact with the wound the collagen stimulates healing, while the low level silver release helps to kill wound bacteria
Arglaes	Film, powder or island dressing containing silver ions in powder form	When the dressing comes into contact with exudate there is a slow release of silver ions which interact with the bacteria in the exudate.

there are clear signs of infection, e.g. cellulitis (White et al, 2001).

However, differentiation between colonisation, critical colonisation and infection is not always straightforward. The signs of critical colonisation, such as a sudden increase in pain, abnormal odour and delayed healing, can be similar to the signs of infection (Brown, 2006).

In wounds which are difficult to assess, advice must be sought from the tissue viability nurse. The challenge within the clinical setting, however, is to ensure that the majority of practitioners recognise critical colonisation with confidence and for the bacterial bioburden to be reduced as soon as possible. This is best achieved by starting a topical antiseptic dressing as soon as the signs of critical colonisation are detected.

Which dressing?

In addition to systemic antibiotic therapy, there are two main generic groups of wound management products that have the potential to reduce the bacterial burden in the wound (*Table 1*). These commonly used compounds are silver and iodine, though there are other agents with the ability to kill a broad-spectrum of bacteria; most notable of these is honey.

In this context, broad spectrum means that the agent is capable of killing the common open-wound aerobic and anaerobic pathogens. In terms of ability to kill bacteria, these dressings are essentially interchangeable, though in clinical practice

some wounds respond to one dressing better than another. This may be as much down to the formulation of the carrier product, as the antiseptic itself.

Silver is effective against a broad range of micro-organisms, including *Pseudomonas aeruginosa* and *Staphylococcus aureus*.

Iodine is an element that has antiseptic properties. Iodine dressings control bacteria on the surface of the wound. Contraindications include patients with thyroid disease, patients with large or deep wounds, and patients with a known allergy to iodine (Morison et al, 1999).

Factors to be considered when selecting an appropriate dressing are size of the wound, site, depth, patient sensitivities/ allergies, presence of slough or infection and whether there are any underlying comorbidities (Ayliffe et al, 2000).

There is no definitive guidance in the literature as to how long wounds should be treated with antimicrobial dressings (Brown, 2006). Bowler et al (2001) suggest that the dressing regimen should be reassessed after two weeks. If there is no improvement after two weeks then it is doubtful that the approach has been effective. It is important to keep the wound care plan under regular review.

The use of topical antibiotics is not justified for the routine treatment of colonised or infected wounds because they can provoke a delayed hypersensitivity reaction, allow colonisation by resistant organisms and select for antibiotic resistance (White et al, 2001).

Conclusion

Antimicrobial dressings containing silver or iodine can be used on acute or chronic wounds, which are critically colonised, or when local and/or spreading infection is already compromising the wound.

Topical antiseptic dressings can be used when spreading infection is present but must always be teamed with systemic antibiotics (Brown, 2006). Iodine and silver dressings can be used prophylactically on wounds in patients who are particularly vulnerable to infection such as those with diabetes, lymphoedema and rheumatoid arthritis, or when the patient has a history of delayed healing or frequently recurrent infection. Wounds which are difficult to assess, and where the wound shows no improvement after two weeks, should be referred to the medical team and advice sought from the tissue viability nurse. Whichever type of dressing is selected, reassess the wound care plan after two weeks and keep it under regular review. Topical antimicrobials, like all products, need to be used appropriately for maximum benefit and cost-effectiveness (Brown, 2006). This is most easily achieved through the use of a systematic assessment framework such as AWM or TIME, wound tracing and photography. These methods provide some objective measures in order to show progress towards healing over time and therefore response to treatment. In the case of topical antimicrobials, favourable outcome should be visible within two weeks from the start of therapy, if it is to occur at all. **WE**

Ayliffe, GAJ, Fraise, AP, Geddes AM, Mitchell K eds (2000) *Control of Hospital Infection* 4th edn. Arnold, London

Bowler, PG, Davies BJ, Armstrong DG (2001) Wound microbiology and associated approaches to wound management. *Clin Microbiol Rev* 14(2): 244–69

Brown A (2006) Prescribing and silver wound products. *J Community Nursing* 20(11): 23–6

Capaldi B (2006) Antimicrobial dressings in wound care. *Nurse Prescribing* 4(8): 320–6

Flanagan M (1997) *Wound Management: ACE Series.* Churchill Livingstone, Edinburgh

Gray D, White R, Cooper P, Kingsley A (2005) Applied wound management. In: Gray D, Cooper P, eds. *Wound Healing: A Systemic Approach to Advanced Wound Healing and Management.* Wounds UK, Aberdeen

Kaye ET (2000) Topical antibacterial agents. *Inf Dis Clin North Am* 14(2): 321–39

Kingsley A (2001) A proactive approach to wound infection. *Nurs Stand* 15(30): 50–8

Morison M, Moffatt C, Bridel-Nixon J, Bale S (1999) *Nursing Management of Chronic Wounds*. Mosby, London

White RJ, Cooper R, Kingsley A (2001) Wound colonisation and infection: the role of topical antimicrobials. *Br J Nursing* 10(9): 563–78

White R, ed (2002) *Trends in Wound Care*. Quay Books, Wiltshire